# REPLY BRIEF

To: General-Director of Patent Office

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REPLY (ARGUMENT)

1) The following opinions were expressed in the Response dated February 21, 2006 issued by the PCT International Searching Authority; namely, that "claims 1, 4, 7 and 8 lack inventive step based on Documents 1 to 3, and Document 4 cited in the second Response. It would be easy for those skilled in the art to perform the target surface processing described in Document 3 to the target described in Documents 1 and 2. Further, it would also be easy for a person skilled in the art to adopt the manufacturing method of a target via melting and rolling described in Document 4 as the manufacturing method of the target described in Documents 1 and 2."

Incidentally, the cited documents are the following Documents 1 to 4.

Document 1: JP11-293454

Document 2: JP9-228037

Document 3: JP6-136524

Document 4: JP2000-199054

2) The amendments are foremost explained.

The description of "a sputtering target containing at least Co, Cr, Pt, B" was introduced to independent claims 1 and 4, and the scope has been limited by specifying the material of the sputtering target.

3) The present invention and Cited Documents 1 to 4 are now compared. Incidentally, for the convenience of comparison, claim 1 and claim 4 (independent claims) are indicated once again below.

(Claims)

[1] (Amended) A sputtering target with few surface defects having a target surface prepared by melting and rolling in which intermetallic compounds, oxides, carbides, carbonitrides and other substances without ductility exist in a highly ductile matrix phase of a sputtering targeting containing at least Co, Cr, Pt, B at a volume ratio of 1 to 50%, substances without ductility are of a size in which the average particle diameter is at least 0.5 to 50$\mu$m, the Vickers hardness of the highly ductile matrix phase is 400 or less, the Vickers hardness of substances without ductility is 400 or more, and the hardness difference thereof is at least 1.5 times, wherein defects of 10$\mu$m or more resulting from machine work do not exist.

[4] (Amended) A surface processing method of a sputtering target with few surface defects, wherein a target surface prepared by melting and rolling in which intermetallic compounds, oxides, carbides, carbonitrides and other substances without ductility exist in a highly ductile matrix phase of a sputtering targeting containing at least Co, Cr, Pt, B at a volume ratio of 1 to 50%, substances without ductility are of a size in which the average particle diameter is at least 0.5 to 50$\mu$m, the Vickers hardness of the highly ductile matrix phase is 400 or less, the Vickers hardness of substances without ductility is 400 or more, and the hardness difference thereof is at least 1.5 times is preliminarily subject to primary processing of cutting work performed to cut an area of 1mm to 10mm from the surface of the target material, and then subject to finish processing via polishing performed to polish an area of 1$\mu$m to 50$\mu$m from the surface after being subject to the primary processing of cutting work, and wherein defects of 10$\mu$m or more resulting from machine work do not exist.

4) Foremost, Cited Documents 1 to 4 and claims 1 and 4 are compared.

Claims 1 and 4 are both related to a "sputtering target containing at least Co, Cr, Pt, B", and are based on a premise of a "target prepared by melting and rolling in which intermetallic compounds, oxides, carbides, carbonitrides and other substances without ductility exist in a highly ductile matrix phase of a sputtering targeting containing at least Co, Cr, Pt, B at a volume ratio of 1 to 50%, substances without ductility are of a size in which the average particle diameter is at least 0.5 to 50$\mu$m, the Vickers hardness of the highly ductile matrix phase is 400 or less, the Vickers hardness of substances without ductility is 400 or more, and the hardness difference thereof is at least 1.5 times."

Further, claim 1 requires a "sputtering target with few surface defects having a target surface, wherein defects of 10$\mu$m or more resulting from machine work do not exist", and claim 4 requires a "surface processing method of a sputtering target with few surface defects, wherein a target surface is preliminarily subject to primary processing of cutting work performed to cut an area of 1mm to 10mm from the surface of the target material, and then subject to finish processing via polishing performed to polish an area of 1$\mu$m to 50$\mu$m from the surface after being subject to the primary processing of cutting work, and wherein defects of 10$\mu$m or more resulting from machine work do not exist."

5) Contrarily, Cited Document 1 relates to an Al system sputtering target

containing intermetallic elements, and indicates the problems of molded (cast) articles and adopts the sintering method. In other words, Document 1 is a reference that negates cast articles.

Needless to say, Document 1 is entirely different from the target of the present invention obtained by casting and rolling. In addition, Document 1 has different materials constituting the target in comparison to the sputtering target material of the present invention containing Co, Cr, Pt, B, and there is no similarity between the two.

Further, although claim 1 requires a "sputtering target with few surface defects having a target surface, wherein defects of 10$\mu$m or more resulting from machine work do not exist", and claim 4 requires a "surface processing method of a sputtering target with few surface defects, wherein a target surface is preliminarily subject to primary processing of cutting work performed to cut an area of 1mm to 10mm from the surface of the target material, and then subject to finish processing via polishing performed to polish an area of 1$\mu$m to 50$\mu$m from the surface after being subject to the primary processing of cutting work, and wherein defects of 10$\mu$m or more resulting from machine work do not exist," there are no such requirements in Document 1 as a matter of course.

Therefore, it would be erroneous to say that the present invention could have easily been devised based on Document 1 trying to resolve the issues inherent in Al.

6) Document 2 relates to reactive sputtering using a mosaic target in which a target of a different substance is mounted on a target upon forming a compound thin film, and is not an integral target prepared by casting and rolling. Further, Document 2 does not have a means for resolving the inherent problems arising in a sputtering target of the present invention containing Co, Cr, Pt, B.

Therefore, Documents 2 does not essentially possess the features of the present invention, and the object, operation and effect are also different. As with Document 1, Document 2 cannot be used as grounds for denying the present invention.

7) Document 3 relates to a target in which the surface roughness of aluminum or its alloy is adjusted, and is based on a premise of an easily-workable material. Document 3 has different materials constituting the target in comparison to the sputtering target material of the present invention containing Co, Cr, Pt, B, and

there is no similarity between the two.

Although Document 3 describes cutting work and finish processing via polishing, without any premise that it is a "target having numerous substances without ductility; that is, phases of different brittleness", the technology of Document 3 cannot be applied to the present invention.

In other words, Document 3 cannot resolve the problems of a target "in which intermetallic compounds, oxides, carbides, carbonitrides and other substances without ductility exist in a highly ductile matrix phase of a sputtering targeting containing at least Co, Cr, Pt, B at a volume ratio of 1 to 50%, substances without ductility are of a size in which the average particle diameter is at least 0.5 to 50$\mu$m, the Vickers hardness of the highly ductile matrix phase is 400 or less, the Vickers hardness of substances without ductility is 400 or more, and the hardness difference thereof is at least 1.5 times."

The present invention does not consider the cause of the generation of particles and nodules to be based on the problem of surface roughness, but rather based on defects of 10$\mu$m or more resulting from machine work. Therefore, the technical spirit of Document 3 is entirely different from the technical spirit of the present invention.

As described in Document 3, although it is considered that defects can be reduced by making the surface roughness smaller, the case of working a soft material that can overcome the foregoing problems by adjusting the surface roughness and the case of using a "sputtering target containing Co, Cr, Pt, B and having numerous substances without ductility; that is, phases of different brittleness", relate to entirely different materials.

In the case of a "sputtering target containing Co, Cr, Pt, B and having substances without ductility" of the present invention, microcracks existing in the brittle substance after machine work become a significant problem. This is because microcracks largely influence the generation of initial particles and nodules arising in relation to such particles.

Document 3 relates to technology focusing on the surface roughness, but the mere fact that the surface roughness is favorable is not able to overcome the problems of the generation of initial particles and nodules arising in relation to such particles. This is because even if numerous microcracks exist in a brittle substance, the surface roughness may show favorable values. In a "target

containing substances without ductility", in order to suppress the generation of initial particles and nodules arising in relation to such particles, rather than controlling the surface roughness, a more essential aspect; that is, the control of microcracks is more important.

As evident from the foregoing explanation, the constituent features described in the claims of the present invention are requirements essential for preventing microcracks from occurring in brittle substances after machine work. With Document 3 that only prescribes the surface roughness, it is not possible to essentially achieve the objects of the present invention. Therefore, we believe that it would be clearly erroneous to consider the present invention and Document 3 to be the same technology, and to apply Document 3 to the present invention.

8) Newly cited Document 4 relates to a manufacturing method of a target via melting and rolling aluminum alloy, and also describes trying to minimize, as much as possible, the aluminum matrix phase and the intermetallic compound, oxide phase and the grain sizes thereof. The object of Document 4 is to miniaturize the crystal grain size as much as possible since splash will easily occur when the difference in the crystal grain size is significant.

Document 4 also has different materials constituting the target in comparison to the sputtering target material of the present invention containing Co, Cr, Pt, B.

The present invention is based on a premise of a target prepared by melting and rolling in which "intermetallic compounds, oxides, carbides, carbonitrides and other substances without ductility exist in a highly ductile matrix phase at a volume ratio of 1 to 50%, substances without ductility are of a size in which the average particle diameter is at least 0.5 to 50$\mu$m, the Vickers hardness of the highly ductile matrix phase is 400 or less, the Vickers hardness of substances without ductility is 400 or more, and the hardness difference thereof is at least 1.5 times," and controls the generation of nodules and initial particles that become a significant problem in this kind of target.

Document 4 has been cited because it uses the same melting and rolling method, and, since it contains an intermetallic compound in the matrix phase of the aluminum alloy target, on first glance it seems that Document 4 has a similar structure as the present invention. Nevertheless, even though the melting and rolling method is the same, the substance to be manufactured and the structure thereof is totally different.

Further, Document 4 merely discusses the number of particles generated in relation to the size of the intermetallic compound and oxide particles. In other words, Document 4 does not in any way refer to the problem of microcracks existing in the brittle substance (intermetallic compound and oxide particles) after machine work. As described above, these microcracks strongly affect the generation of initial particles and nodules arising in relation to such particles, and it would be clearly erroneous to apply Document 4, which lacks the foregoing perspective, to the present invention.

Moreover, Document 4 aims to prevent splashes by making the average grain size of the intermetallic compound phase to be 3 microns or less, but needless to say, it is not possible to inhibit the generation of initial particles resulting from microcracks and nodules arising in relation to such particles merely be depending on the average grain size of the intermetallic compound phase being 3 microns or less.

This is because the problem of generation of initial particles and nodules arising in relation to such particles is based on microcracks formed in the intermetallic compound and oxide particles existing in the structure. The foregoing problem cannot be resolved merely by adjusting the size of particles existing in the target.

As evident from the above, the constituent features described in the claims of the present invention are for preventing microcracks from occurring in brittle substances after machine work. Since Document 4 lacks the conditions for preventing microcracks, it would be clearly erroneous to consider that the present invention could have been easily devised based on Document 4.

9) As described above, the foregoing problems cannot be overcome by Document 3 which subjects the aluminum or its alloy, which can be easily worked, to cutting work and polish finishing, and Document 4 which adjusts the grain size of the melted and rolled structure. In other words, in a target having numerous substances without ductility and phases having different brittleness, ultimately there is a problem of defects caused by machine work, and insight and means of eliminating defects of 10$\mu$m or more resulting from machine work are required. Documents 1 to 4 do not describe this in any way.

Although the Response indicates that the present invention could have been easily devised based on the combination of technology described in Documents 1

to 4, as described above, the present invention relates to a "sputtering target containing Co, Cr, Pt, B", whereas Document 1 relates to a different Al sintered target, Document 2 relates to a mosaic target, Document 3 relates to the adjustment of the surface roughness by performing cutting work and polish finishing upon preparing aluminum or its alloy target with ductility, and Document 4 relates to technology for adjusting the grain size of the target structure in order to prevent splashes in the target prepared from a melted and forged article.

The present invention is based on a premise of a "sputtering target containing Co, Cr, Pt, B", and, in a target having numerous substances without ductility; that is, phases of different brittleness prepared by melting and rolling in which intermetallic compounds, oxides, carbides, carbonitrides and other substances without ductility exist in a highly ductile matrix phase of a sputtering targeting containing at least Co, Cr, Pt, B at a volume ratio of 1 to 50%, substances without ductility are of a size in which the average particle diameter is at least 0.5 to 50$\mu$m, the Vickers hardness of the highly ductile matrix phase is 400 or less, the Vickers hardness of substances without ductility is 400 or more, and the hardness difference thereof is at least 1.5 times, the object is to arrive at a method of preventing the generation of nodules and particles, and the invention obtains a target free of defects such as cracks, dents, drop offs and so on through cutting work and polish finishing. Documents 1 to 4 do not have such a demanding object or conditions for achieving such object.

Therefore, we believe that it would be erroneous to consider that the invention of claim 1 could have been easily achieved from Documents 1 to 4. Further, other claims 7 and 8 are dependent on claim 4, and, therefore, we believe that these also possess inventive step.

10) Accordingly, the invention of the present PCT application could not have been easily devised based on the technology described in Cited Documents 1 to 4, and we believe that the present invention clearly possesses inventive step in view of the cited (conventional) art.